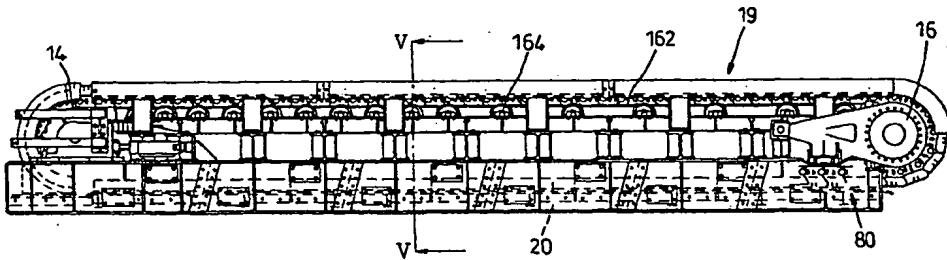




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(54) Title: A PLATE CONVEYOR



## (57) Abstract

A plate conveyor (10, 50) having a continuous conveying bed (18) guided to have an upper run (19) extending between a loading end and a delivery end and a lower run (20) located beneath the upper run, collection means (80) located beneath the lower run for collecting finer particulate material falling from the lower run and transfer means (70) formed on the conveying bed for transporting particulate material collected by the collection means away from the collection means and to said upper run.

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## A PLATE CONVEYOR

The present invention relates to a plate conveyor, in particular but not exclusively, a plate conveyor for conveying material containing large lumps mixed with finer particulate material.

In open cast mining, it is known to deposit won material onto a plate conveyor so as to be fed to a mineral breaker in order to be broken down.

The won material typically contains large lumps of mineral mixed with finer particulate material.

A typical plate conveyor comprises a conveying bed defined by a plurality of side by side plate members which are hingedly connected to one another.

The conveying bed has an upper run upon which the won material is deposited at one end, viz. the loading end. The deposited material is then transported by the moving conveying bed along the upper run to be discharged from the delivery end of the conveyor.

With plate conveyors of this type, finer particulate material has a tendency to stick to the moving plates and so remain in contact with the plates after passing the delivery end of the conveyor. This finer material is therefore transported to the lower run of the conveyor bed and tends to fall therefrom. In order to avoid an undesirable build-up of material beneath the plate conveyor, it is usual to provide a separate belt conveyor located beneath the plate conveyor in order to catch the finer particulate material which falls from the lower run of the plate conveyor. The belt conveyor

tends to require frequent maintenance and adds extra expense to an installation.

A general aim of the present invention is to provide a plate conveyor  
5 which is capable of transporting particulate material falling from the lower run of the conveying bed back to the upper run of the conveyor.

According to one aspect of the present invention there is provided a plate conveyor having a continuous conveying bed guided to have an upper run  
10 extending between a loading end and a delivery end and a lower run located beneath the upper run, collection means located beneath the lower run for collecting finer particulate material falling from the lower run and transfer means formed on the conveying bed for transporting particulate material collected by the collection means away from the collection means  
15 and to said upper run.

Preferably the collection means comprises a flat bed extending along the length of said lower run.

20 Preferably the transfer means comprises a plurality of scraper bars extending laterally across the conveying bed, the scraper bars being spaced at desired locations along the length of the conveying bed.

25 Preferably the conveying bed comprises a plurality of plate members located side by side along the length of the bed, each plate being connected to a pair of drive transmission chains, each chain being formed in a continuous loop.

Accordingly, the plates are flexibly connected to one another by the chains.

Preferably the scraper bars are located upon selected plates and project by  
5 a predetermined height above the conveying bed defined by the plates.

The scraper bars on the lower run are thus arranged to contact the flat bed to support the lower run of the conveying bed.

10 Accordingly the weight of the plates whilst in the lower run act to press the scraper bars into contact with the upper surface of the flat bed and so enable the scraper bars to scrape particulate material along the surface of the flat bed and move it toward the loading end of the conveyor. Since adjacent plates are flexibly joined to one another, the plates located  
15 inbetween adjacent scraper bars sag downwardly toward the flat bed and so encourage particulate material, adhering and bridging adjacent plates, to fall onto the flat bed.

20 Preferably forwardly projecting weir plates are provided at each end of each scraper bar in order to discourage lateral movement of the finer particulate material during transport of material along the upper run.

Various aspects of the present invention are hereinafter described with reference to the accompanying drawings in which:-

25 Figure 1 is a schematic side view of a plate conveyor arranged to feed material to a mineral breaker;

Figure 2 is a plan view of a plate conveyor according to an embodiment of the present invention;

Figure 3 is a side view of the plate conveyor shown in Figure 2;

Figures 4a, 4b & 4c are partly broken away side views of the plate conveyor of Figure 3 showing in greater detail the loading end, a central region and the delivery end respectively;

Figure 5 is a sectional view taken along line V-V in Figure 3;

5 Figure 6 is an enlarged view of the region marked VI in Figure 5;

Figure 7 is an enlarged view of the region marked VII in Figure 5;

Figure 8 is an enlarged view similar to Figure 6 taken at a section location mid-way inbetween a pair of scrapers;

10 Figure 9 is a plan view of a plate for forming the conveyor bed of the plate conveyor shown in Figure 2;

Figure 10 is a front side view of the conveyor plate shown in Figure 8;

Figure 11 is a sectional view taken along line XI-XI in Figure 10.

15 Referring initially to Figure 1, there is schematically shown a plate conveyor 10 of the type with which the plate conveyor of the present invention is particularly concerned. The plate conveyor 10 is arranged to feed material, such as material being mined in an open cast mine, to a mineral breaker 12. The won material typically includes large lumps of 20 mineral mixed with finer lumps and particulate material such as soil and sand. The mineral breaker 12 may be a twin roll miner sizer of the type described in our European Patent No. 0 167 178.

The conveyor 10 includes a pair of sprocket drums 14, 16 around which 25 the conveying bed 18 is trained. One of the sprocket drums is driven by a motor (not shown) so as to move the conveying bed 18 in the direction of arrow F. The conveying bed 18 therefore has an upper run 19 and a lower run 20 extending inbetween the drums 14, 16.

The end of the conveyor 10 adjacent to drum 14 is the loading end and the end adjacent to the drum 16 is the discharge or delivery end.

Accordingly material deposited at the loading end (as indicated by arrow 5 L) is transported on the upper run 19 of the conveying bed to the delivery end to be discharged into the mineral breaker 12 as indicated by arrow D. Typically hopper side walls 24 are provided to retain and guide transport of material along the conveyor 10 for discharge.

10 A plate conveyor 50 according to a preferred embodiment of the invention is illustrated in Figures 2 to 11 wherein.

Parts similar to those identified in Figure 1 have been designated by the same reference numerals.

15

The conveying bed 18 of conveyor 50 comprises a plurality of side by side conveying plates 60, one of which is illustrated in detail in Figures 9 to 11.

20 Each conveying plate 60 is secured, preferably by bolts 61, to a pair of spaced transmission chains 162, 163. The chains 162, 163 are each formed into a continuous loop and are trained about sprocket drums 14, 16.

25 The chains 162, 163 are supported on rollers 164 whilst passing along the upper run 19.

Each plate 60 has an elongate plate body 62 which preferably has a plurality of upstanding ribs 63 for assisting gripping of material deposited

onto the upper run 19. Each plate 60 is preferably formed from rolled steel which enables the sectional shape and dimensions of the plate to be accurately formed.

- 5 At each outer end of the plate body 62 there is provided an upstanding side plate 66. The side plates 66 assist in guiding movement of the conveying bed 18 by restricting lateral displacement and also help to restrict flow of finer particulate material over the sides of the conveying bed 18. These features are more fully described below.

10

The conveying plate 60 illustrated in Figures 9 to 11 further includes a scraper bar 70 which is preferably integrally formed with the plate body 62. The bar 70 extends continuously along the length of the plate body 62 but terminates inboard of the respective side plates 16 to define a gap 72.

- 15 As more clearly seen in Figures 5, gaps 72 accommodate the lower side edges of hopper walls 24.

A pair of weir plates 74 are preferably provided, located at respective ends of each scraper bar 70. The weir plates 74 extend forwardly, ie. 20 extend away from the scraper bar in the direction of movement F of the conveying bed 18 and serve the purpose of discouraging particulate material which is being pushed forward by the scraper bar from spilling sideways past the lower side edges of the hopper walls 24 toward the side plates 66.

25

For reasons discussed below, the height of the scraper bar 70 above the plate body 62 is chosen to be greater than that of both the side plates 66 and weir plates 74.

The conveyor 50 has a main frame 51 and this includes a pair of rails 52 which co-operate with the side plates 66 to guide the conveying bed 18 as it travels along its upper run 19.

- 5 The rails 52 extend continuously along each side of the upper run 19 and each include a vertical side wall 53.

The inside face 53a of each side wall is closely spaced from the outer side face 66a of the facing side plate 66.

10

Accordingly, opposed side faces 53a, 66a co-operate to guide longitudinal movement of the upper run 19 of the conveying bed. Preferably face 53a and/or face 66a is treated to provide a hard wearing face which is resistive to abrasive wear.

15

Each rail 52 has a bottom wall 54 which extends inwardly underneath the side margins of the conveying bed 18.

20  
25

A rib 56 is provided on the bottom wall 54 and is located inboard of the side wall 53 to thereby define a shallow open topped channel 156 which extends continuously along the rail 52.

25

Preferably each plate 60 is provided with a support block 67, preferably formed of steel, which is located so as to be received within the channel 156 and be of a size so as to preferably extend across the majority of the width of the channel 156. The block 67 is preferably chosen so as to have a height sufficient to support the plate 60 above rib 56 with clearance. Accordingly the weight of plate 60 and any load carried thereby ensures that blocks 67 slidingly abut against the upper surface of the bottom wall

of channel 56 and accordingly act as scrapers to move any fine particulate material which may have passed by the lower edges of the hopper walls 24 and the side plates 66 along the channel 156 to be discharged at the discharge end of the conveyor.

5

Accordingly spillage of finer particles sideways from the upper run 19 of the conveying bed is controlled.

As the conveying bed 18 passes over the sprocket drum 16, the plates 60 enter into a collection means 80 which extends continuously along the lower run 20 of the conveying bed 18.

The collection means 80 includes a flat bed 81 preferably formed in longitudinal sections located end to end along the length of the flat bed 81.

15 Each section is preferably formed from a plate of steel.

The flat bed 81 is located adjacent to the lower run 20 such that the scraper bars 70 are able to rest upon the flat bed 81 and thereby support the weight of the lower run 19.

20

Accordingly, any particulate material which has adhered to the conveying bed 18 and been transported to the lower run 19 is no longer supported on the conveyor plates 60 and so is likely to fall upon the flat bed 81.

25 The material which has fallen onto the flat bed 81 is scraped along the flat bed 81 by the scraper bars 70 and so moved toward the loading end of the conveyor.

The conveyor 50 is provided at its loading end with a cowling 90 which covers the run of the conveying bed 18 as it passes around the sprocket drum 14. The cowling 90 is closely spaced from the conveying bed such that the scraper bars 70 are able to transport the material being scraped thereby around the sprocket drum 14 and to the upper run 19. The material scraped by each scraper bar 70 will thereafter be conveyed to the discharge end of the conveyor for discharge.

Since the scraper bars 70 support the weight of the lower run 20 of the conveying bed, they are maintained in sliding abutment with the upper surface of the flat bed 81 and so prevent a build up of material on the bed 81.

In addition, scraper bars 70 are preferably only provided on selected conveying plates 60. Accordingly, those plates 60 not having scraper bars 70 are not directly supported on the flat bed 81 and so the conveying bed 18 located inbetween adjacent scraper bars 70 tend to sag toward the bed 81. This is illustrated in Figure 4b. This sagging action helps to dislodge particulate material adhering to the bed 18 and encourage it to fall onto the flat bed 81.

An upstanding rib 85 extends continuously along each side of the flat bed 81 and is located at a position so as to be received within gaps 72; the ribs 85 thereby acts to resist sideways spillage of the particulate material whilst it is being scraped along the bed 81 by scraper bars 70 and also act to keep gaps 72 clear of material.

Upstanding side plates 95 are provided along each side of the bed 81 for co-operation with side plates 66 to guide longitudinal movement of the conveying bed 18 along the lower run 20.

- 5 Preferably, as illustrated in Figures 4b, and 8, the height of the ribs 85 are less than the height of side walls 66 such that when the conveying bed 18 sags inbetween adjacent scraper bars 70, intermediate plates 60 are supported by top edges of the side plates 66 abutting the upper surface of the bed 81. As seen in Figure 8, the side plates 66 substantially fill the width of the channel 97 defined between bed 81, rib 85 and adjacent side plate 95 and so these side plates 66 act to scrape material along channel 97 in order to keep it clear.
- 10

**CLAIMS**

1. A plate conveyor having a continuous conveying bed guided to have an upper run extending between a loading end and a delivery end and a lower run located beneath the upper run, collection means located beneath the lower run for collecting finer particulate material falling from the lower run and transfer means formed on the conveying bed for transporting particulate material collected by the collection means away from the collection means and to said upper run.

10

2. A plate conveyor according to Claim 1 wherein the collection means comprises a flat bed extending along the length of said lower run.

15

3. A plate conveyor according to Claim 1 or 2 wherein the transfer means comprises a plurality of scraper bars extending laterally across the conveying bed, the scraper bars being spaced at desired locations along the length of the conveying bed.

20

4. A plate conveyor according to Claim 1, 2 or 3 wherein the conveying bed comprises a plurality of plate members located side by side along the length of the bed, each plate being connected to a pair of drive transmission chains, each chain being formed in a continuous loop.

25

5. A plate conveyor according to Claim 4 wherein said plates are flexibly connected to one another by said chains.

6. A plate conveyor according to Claim 4 or 5 when dependent upon Claim 3 wherein said scraper bars are located upon selected plates and

project by a predetermined height above the conveying bed defined by the plates.

7. A plate conveyor according to Claim 3 or 6 wherein the scraper bars on the lower run contact the flat bed to support the lower run of the conveying bed.

8. A plate conveyor according to any of Claims 4 to 7 wherein each of said plates is formed from rolled steel.

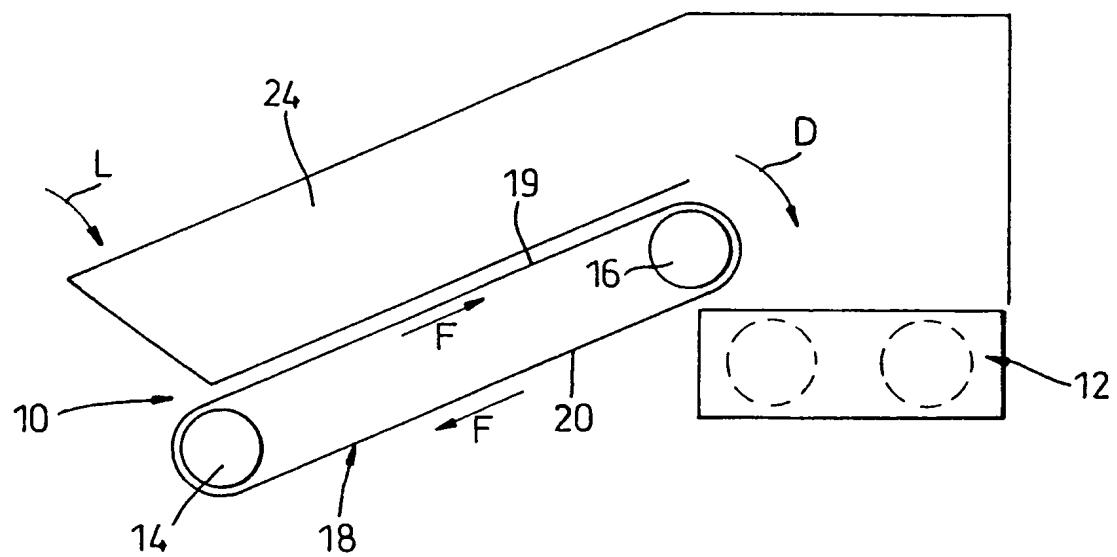
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9. A plate conveyor according to any of Claims 3 to 8 when dependent on Claim 2 wherein an upstanding rib extends continuously along each side of the flat bed to resist sideways spillage of particulate material whilst it is being scraped along the flat bed by the scraper bars.

15

10. A plate conveyor according to any of Claims 3 to 9 wherein at said loading end of the conveyor, a cowling is provided, the cowling being closely spaced from said conveying bed such that said scrapers are able to transfer particulate material from said lower run to said upper run.

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*Fig. 1*

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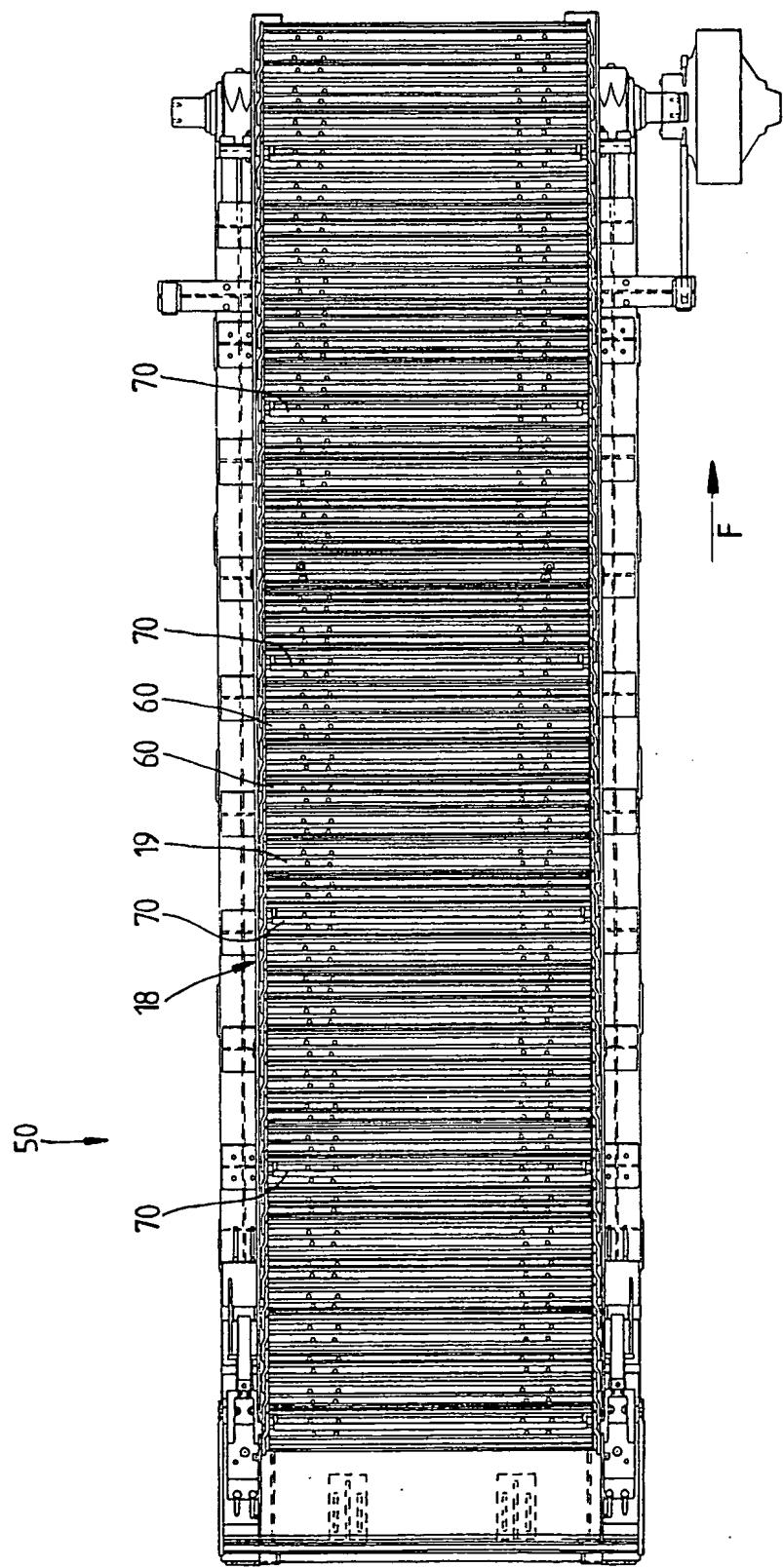


Fig. 2

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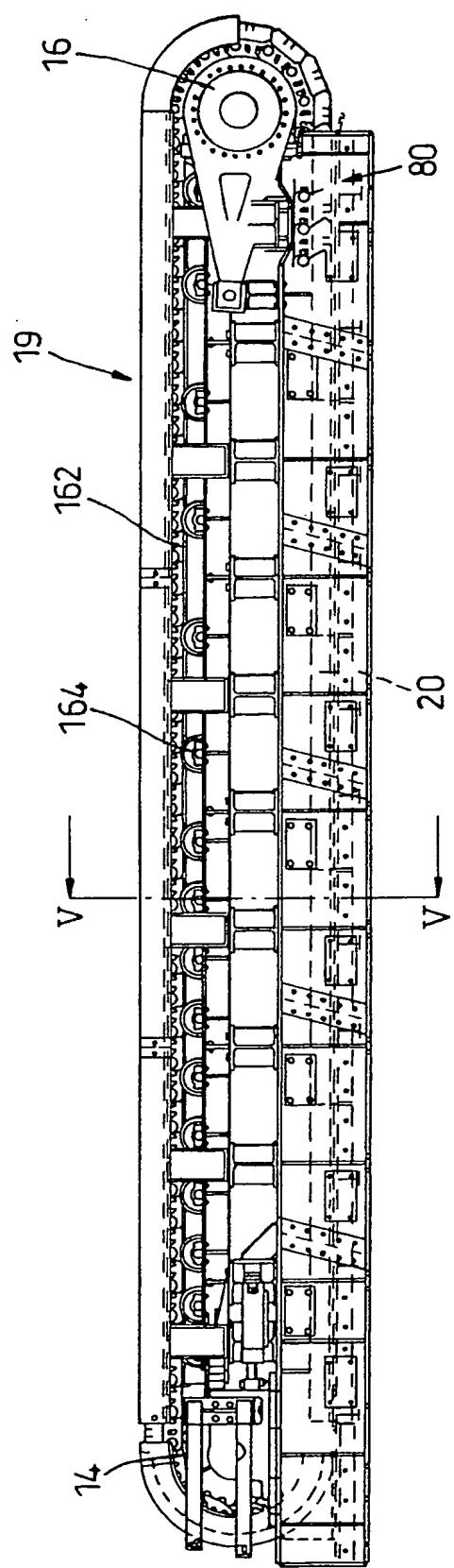


Fig. 3

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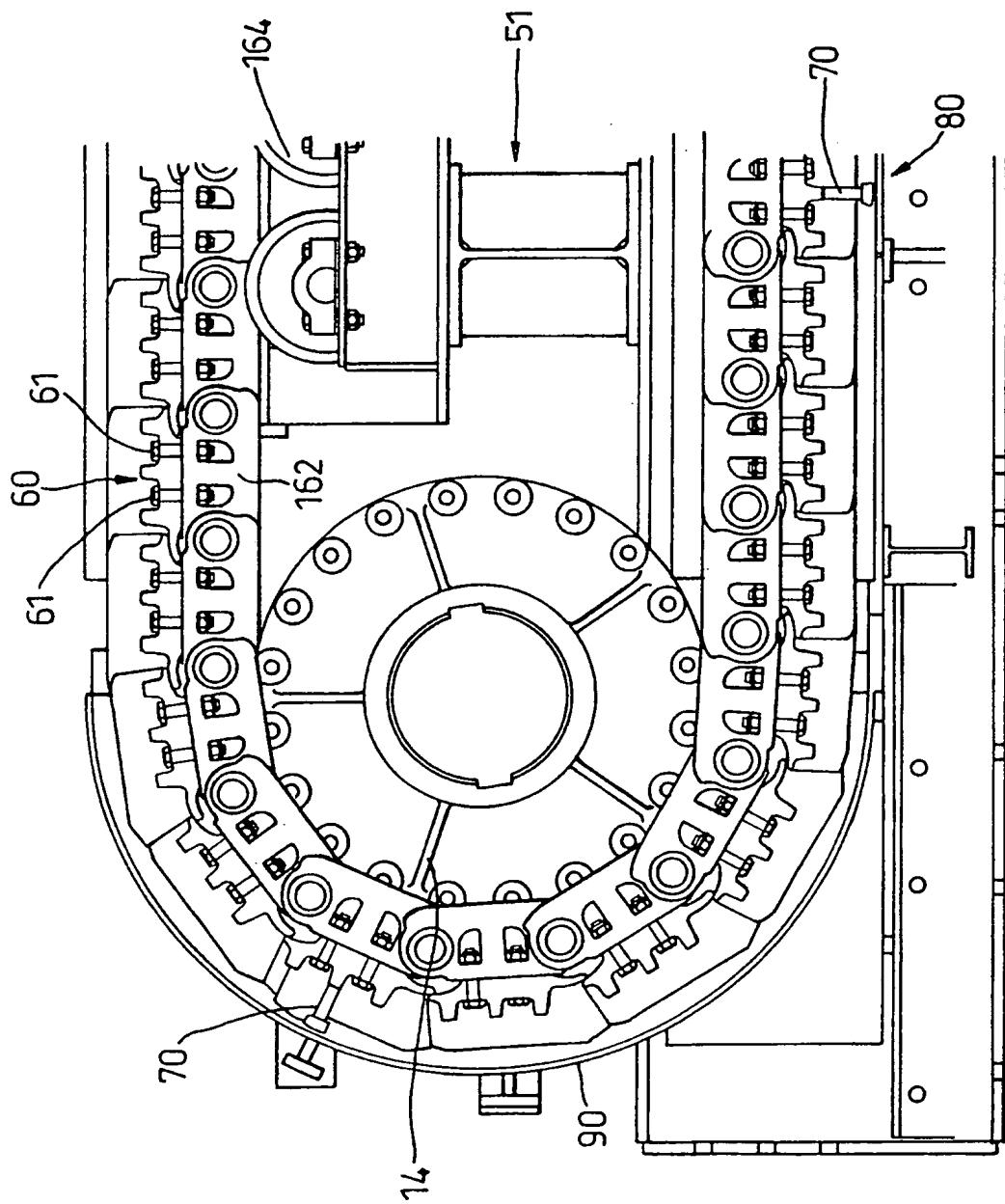


Fig. 4a

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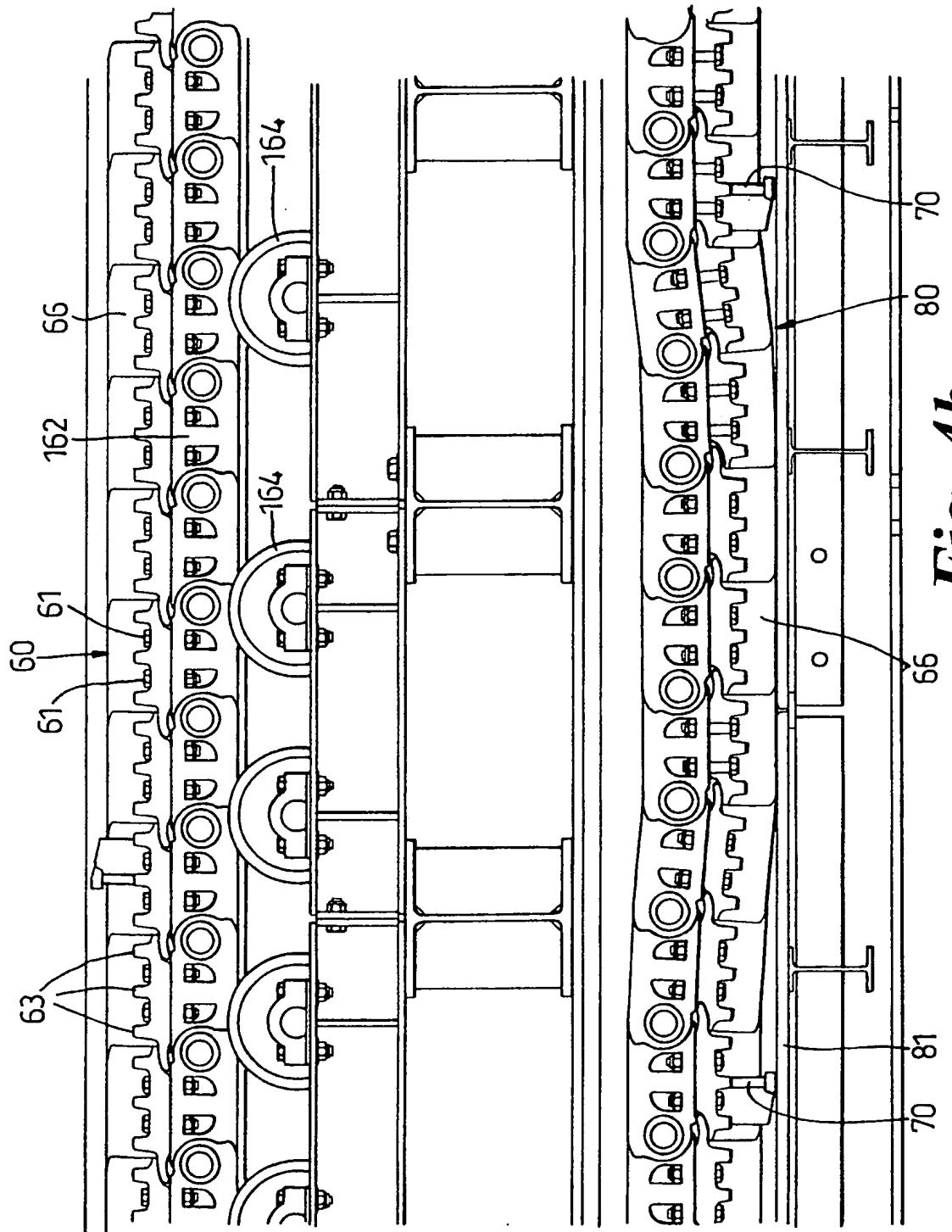


Fig. 4b

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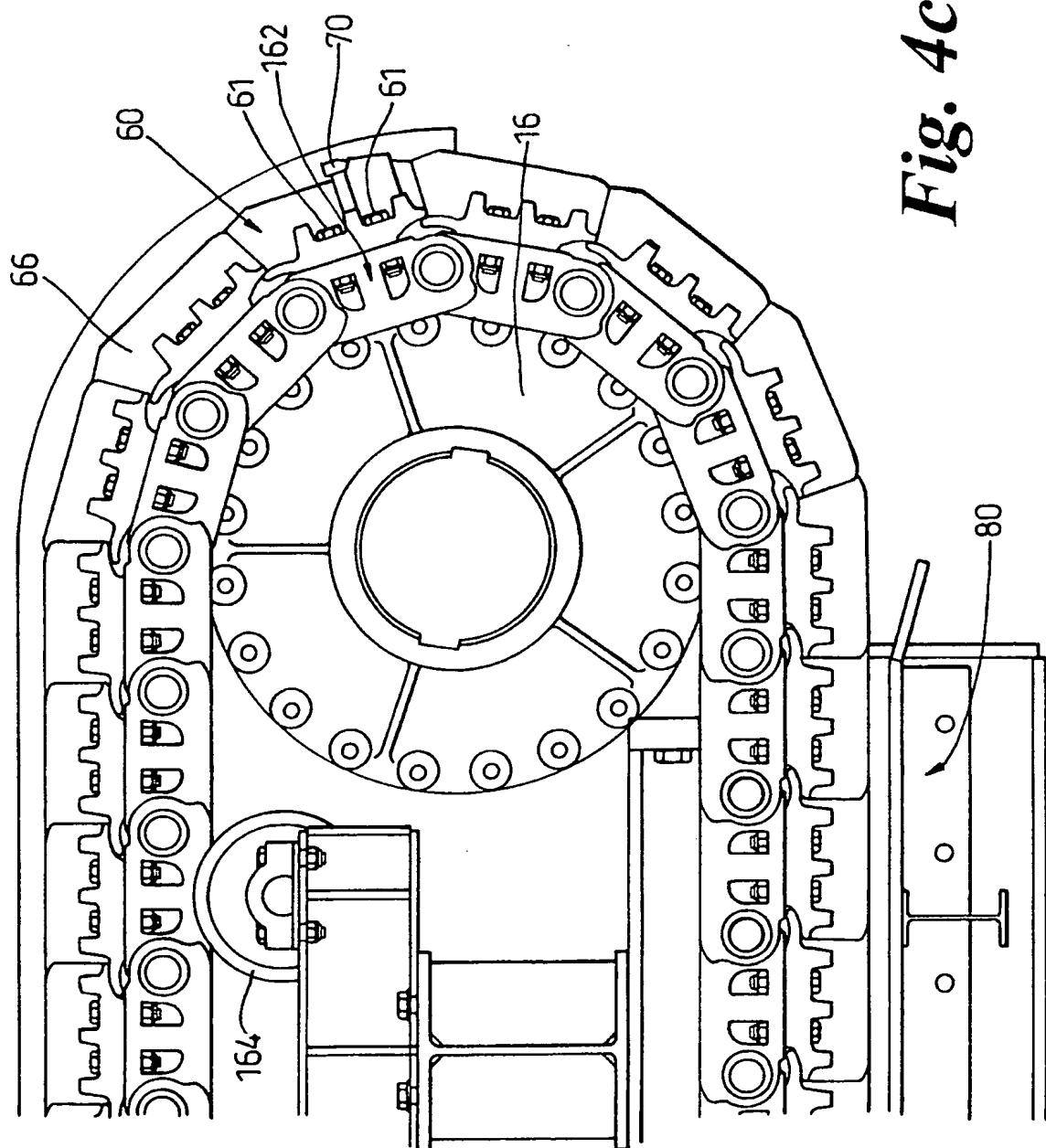
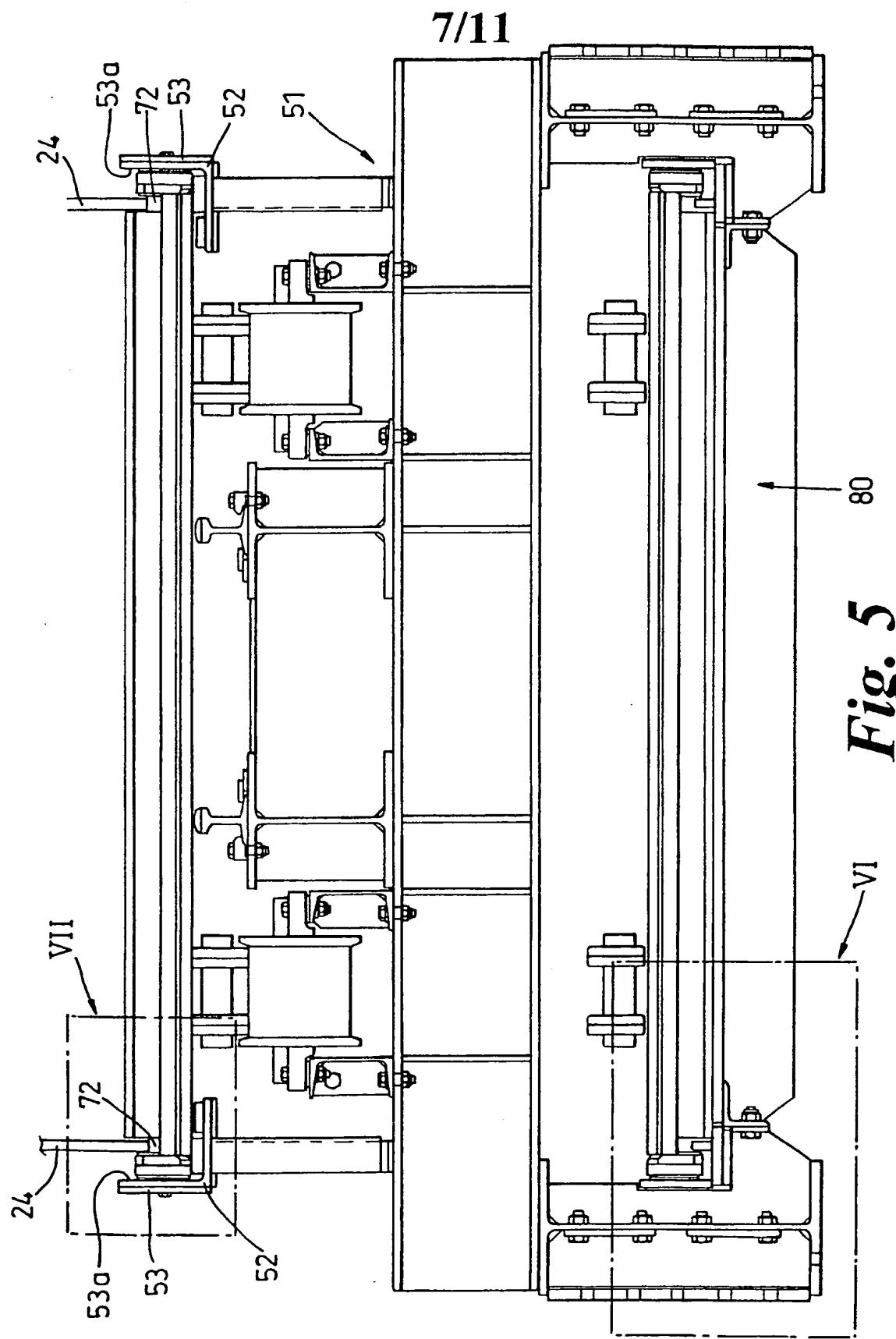


Fig. 4c



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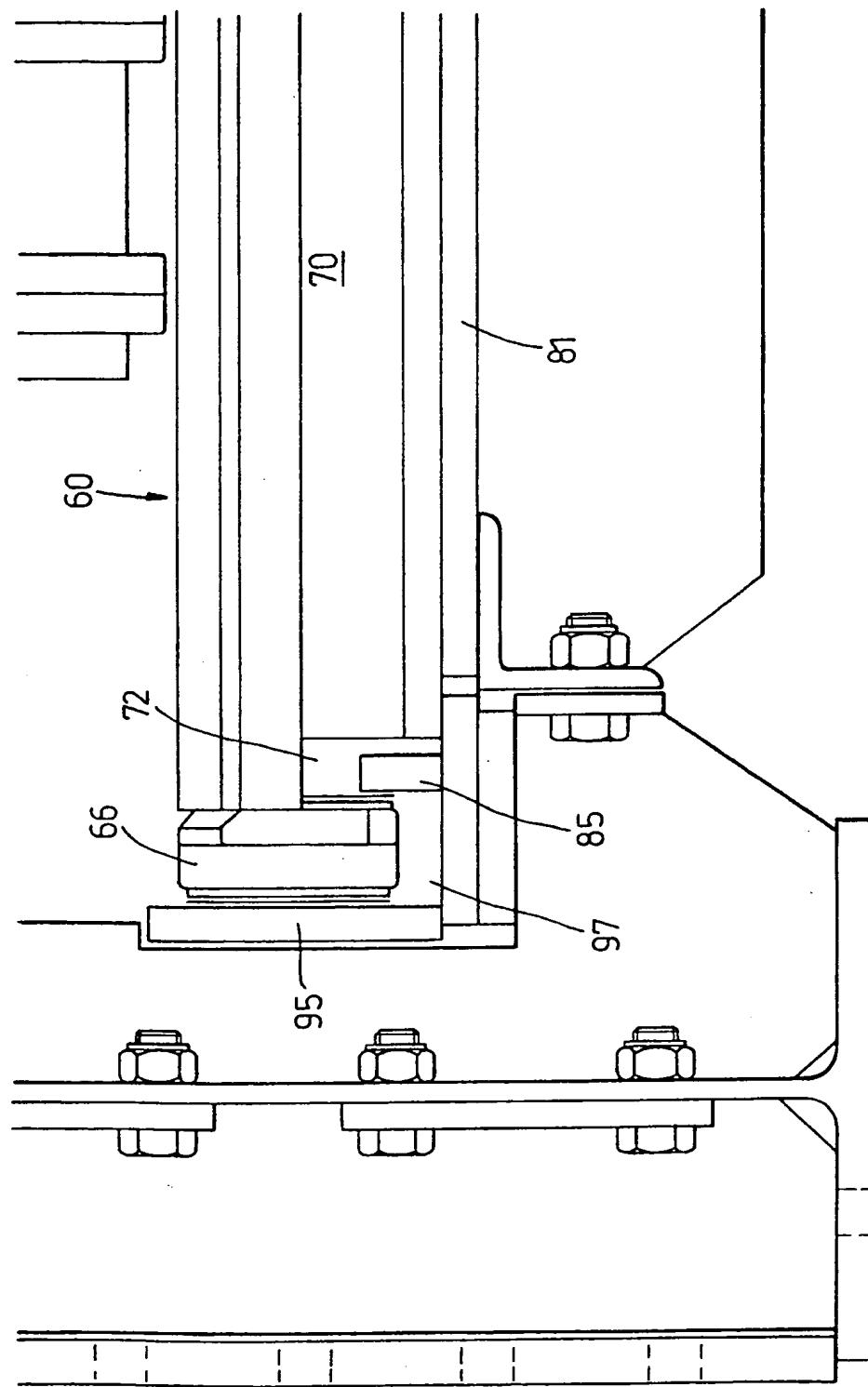
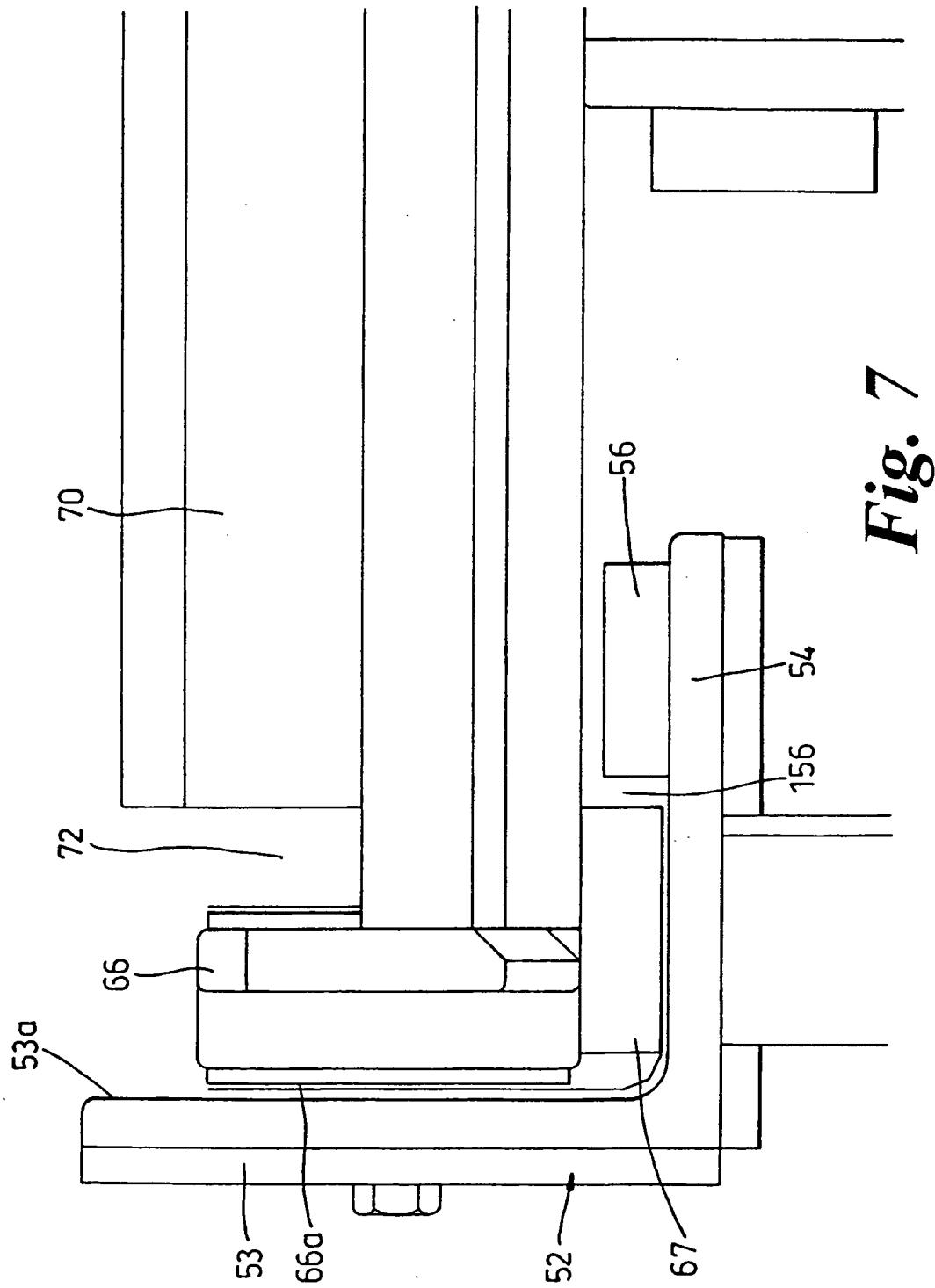


Fig. 6

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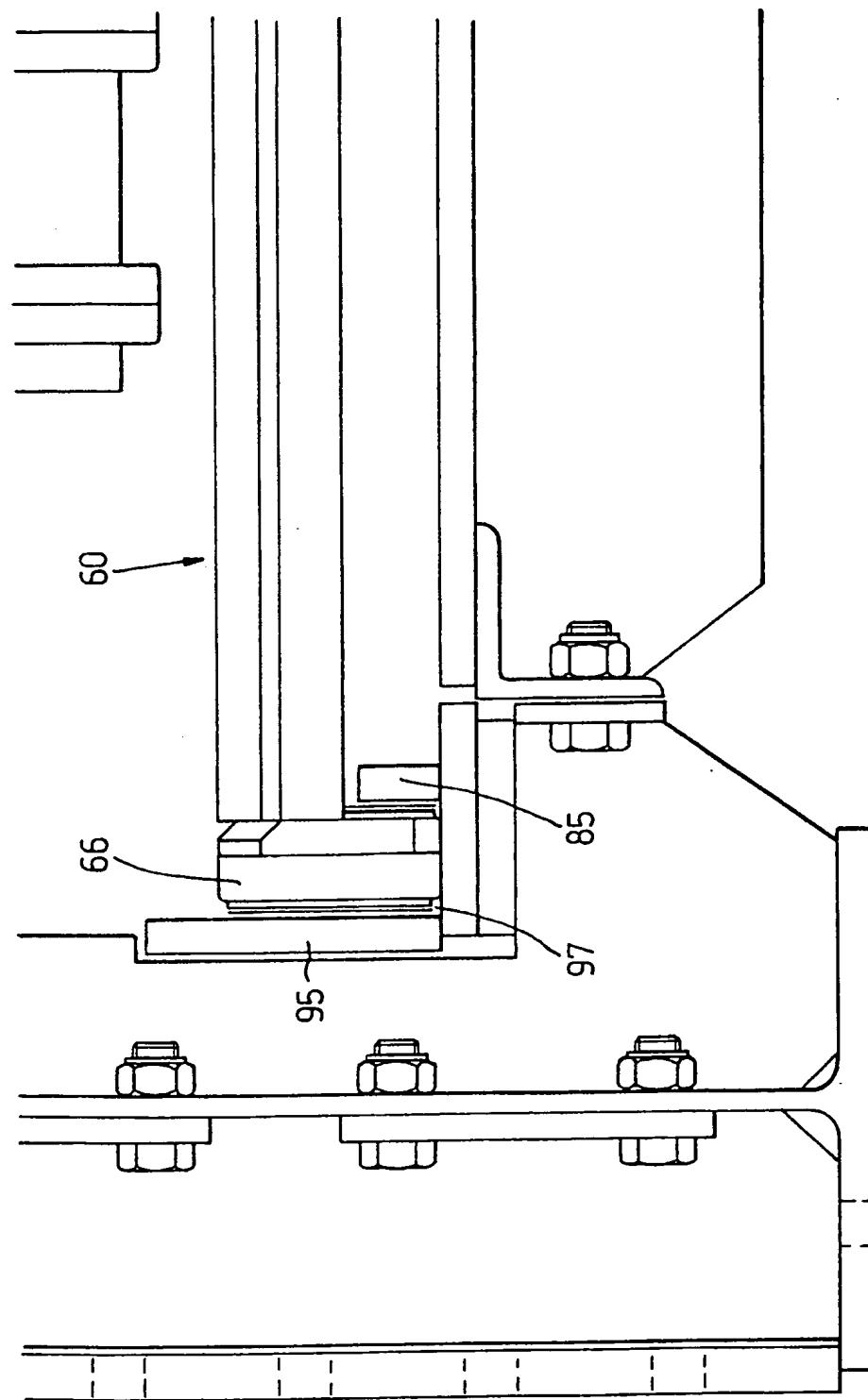
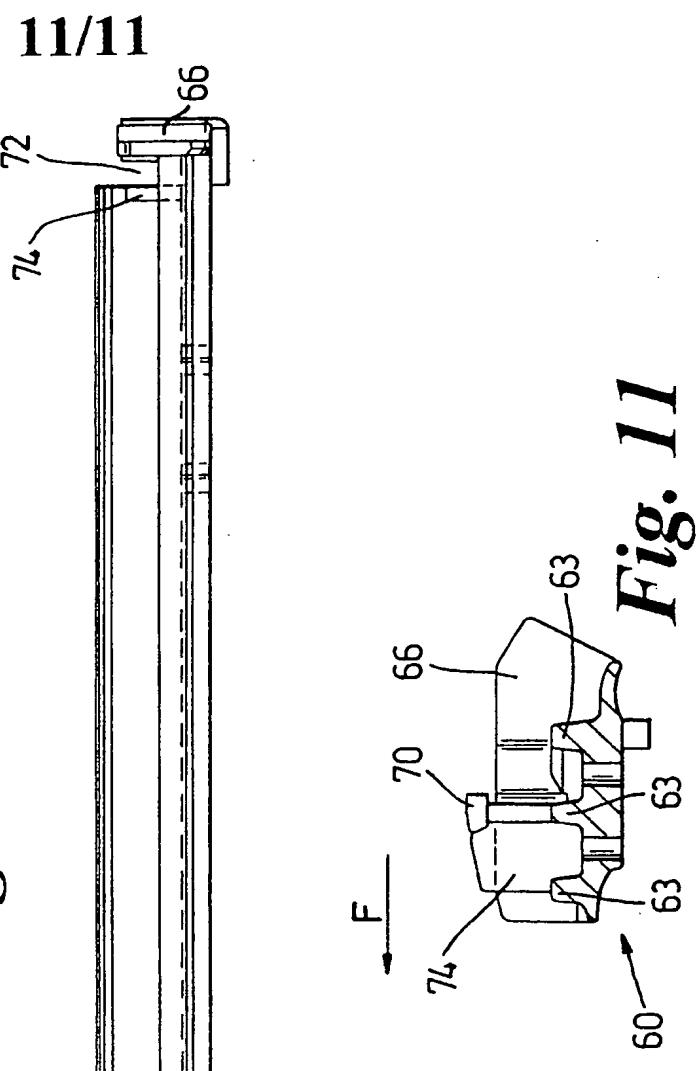
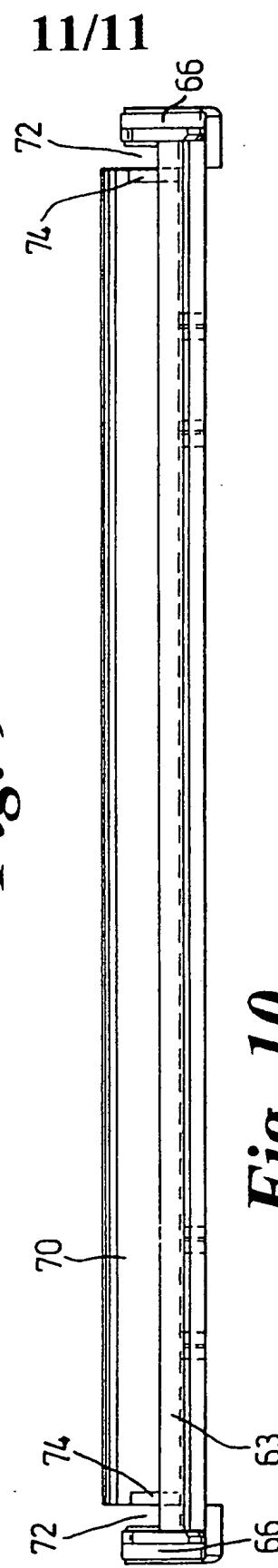
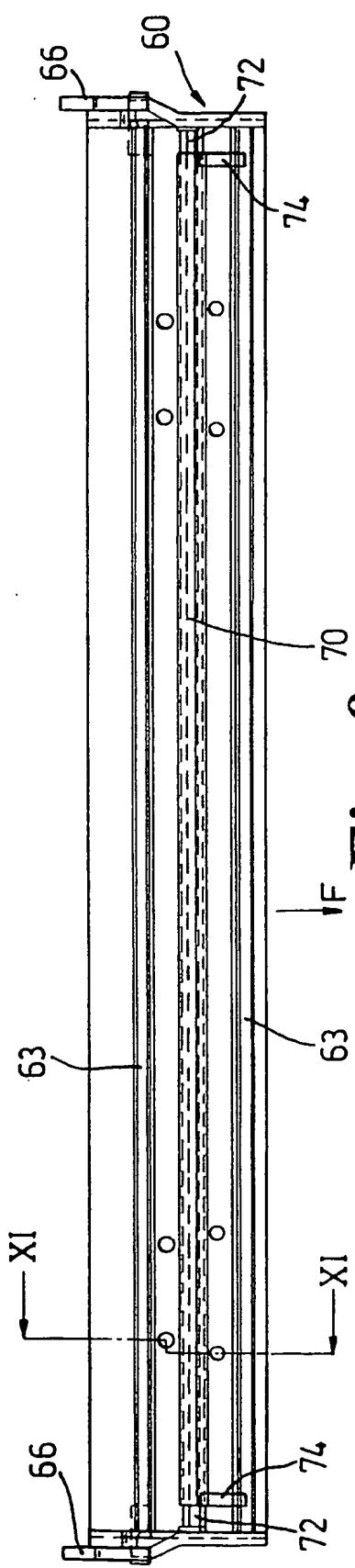


Fig. 8



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/02700

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 B65G17/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 964 127 C (KNAUST AND KRITTER) 9 May 1956 (1956-05-09) the whole document ---	1-10
X	FR 2 515 154 A (ETUDE SERVICE TECHNOLOGIE SARL) 29 April 1983 (1983-04-29) the whole document -----	1-5, 7-10

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Patent family members are listed in annex.

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29 November 1999

Date of mailing of the international search report

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DE 964127	C	NONE	
FR 2515154	A	29-04-1983	NONE